

[ABSTRACT]

The present invention provides a method for forming a uniform thickness vacuum CVD film on a surface of a substrate having a good step coverage and high quality. A process gas is supplied in a process chamber, which is closed by closing an exhaust port by closing a pressure control gate valve which is disposed between the process chamber and a vacuum pump. The process gas supply is stopped and a deposition on the substrate progresses for a certain period of time in the process chamber under pressure equilibrium closed condition. Thereafter or concurrently, in the same process chamber, an oxidizing gas or a nitrifying gas is supplied with plasma to oxidize or nitrify the formed film. By repetition of several cycles of these steps, a predetermined thickness film with high quality is obtained.